SMITHSONIAN DEPOSIT

THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

Publishing Office, No. 42 Pine Street.

to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science.

VOLUME XX.—No. 5. Whole No. 353. | NEW YORK, MONDAY, MARCH 2, 1874. | $3 PER ANNUM IN ADVANCE.

Second Chemical and Sanitary Report upon the Water Supply of the Cities of Newark and Jersey City, in New Jersey.

By Professor Henry Wurtz.

[Concluded from page 60.]

VII.—THE CROTON WATER.

The Croton and its branches rise from and flow through a country identical in geological character with that traversed by the Rockaway, Pequannock and Ramapo, but it nevertheless receives the drainage from all the towns for twenty-five miles along the Harlem railroad, besides a good many other settlements and farming districts scattered throughout its water-shed. I was led therefore to anticipate some interest from a few comparative, though partial tests of samples from the New York hydrants. The results —(Nos. 14 and 15), appear to show that our water of the Lower Passaic, even with all *its* contaminations, does not *as yet* suffer much in a comparison with the Croton. I would call attention particularly to the comparative chlorine tests.

Still, it is evident we have it within our power to improve very greatly on this, and it is to be borne in mind that purity of water-supply has already been—and in the future, is to be, to a far greater extent—a paramount element of prosperity in a city. Those who conduce to progress in this respect, are eminently entitled to be enrolled among the benefactors of their community. If we are wise, will take time by the forelock, and not wait for the Rider on the Pale Horse to come and drive us to our duty with some terrible death-dealing scourge.

VIII.—POLLUTION OF TOWN WELLS AND PUMPS.

The members of your Honorable Commission are doubtless all familiar with much of the literature of this topic. I shall not go over, therefore, the well-known historical facts which are now so abundantly on record, and which show that epidemic diseases have been on numerous occasions propagated throughout whole communities by the water from a well or pump that had become contaminated by drainage. I might, however, cite here one case that has occurred in the United States, within the last month. It was reportep but a few weeks since from Davenport, Iowa, where 19deaths from cholera (or what passed for it) had occurred at the time within two days, that "nearly all the cases may be traced to the suicidal use of water from the wells below the bluffs, which are little else than reservoirs of poison from sewage."

My attention was called to this subject in a conversation with his Honor Mayor Ricord, who stated that more than one-quarter of the inhabitants of Newark still used well water.* Knowing from the character of the soil in Newark, chiefly porous fluviatile sands and glacial drift, that this must be very unsafe, I requested Mr. Bailey to designate two or three of the public pumps most resorted to, that I might make examinations. He indicated three, from which were obtained the samples whose contents are specified in Table I (Nos. 18, 19 and 20). Without occupying space with minute discussion, I shall only direct attention to the amount of common salt in Nos. 18 and 19—(column 12), about five grains to the gallon, of an ingredient which cannot be traced to any other source than infiltration of urine, of man or beast, or both. No. 20 is not so bad. It appears to me that strict prudence should prompt the closing of wells Nos. 18 and 19, and of all others that may be found to be receptacles of ooze and soakage from the contaminated soil under the city.

IX.—BRIEF REMARKS ON SEWAGE-POLLUTION OF RIVERS.

This is also a subject that has been bewritten so much that it may not be advisable for me to expend much space upon it.

That class of scientists who study microscopic fungi, mycologists (in common with many distinguished scientific physicians), are now settling down to the belief that most epidemic and epizootic diseases are accompanied (as *causes*, not merely as effects) by certain fungoid growths; in other words that these diseases are produced by vegetable parasites. When these fungi take root in live animal tissues, they develop into abnormal and monstrous forms, which have not been recognized until lately; but it is now known that the spores discharged (by millions of millions, it may be) with the excreta, when cultivated *outside* the body, come back again to their normal forms, and the fungi are recognizable. Thus, in common dysentery and cholera morbus, the spores, when replanted, produce a common fungoid parasite of wheat, while during the fearful Asiatic cholera the spores produce a parasite of the East Indian rice plant. These facts (if they must be admitted as such, which seems inevitable) are suggestive with regard to sewage contamination of rivers. One case of cholera brought to Paterson, or any one of the towns lying on the upper Passaic, might fill the whole river with the living seeds of the pestilence. A like propagation would take place from Newark throughout Jersey City and Hoboken, and even throughout Newark itself! I am aware that these are appalling considerations, and may be rejected by some as contingencies too remote and dreadful to be possible; but human experience, alas, will not countenance any such puerile view as this. We must stare these horrors sternly in the face, bring all our science to bear, and study prevention, rather than wait till called upon to endure the evil when it shall have passed beyond our cure.

X.—CONCLUSIONS.

1. In addition to the rapid agencies of self-purification and nitrification, by oxidation, that were shown by the analyses of last winter, to act in the Passaic water—the analyses of the past summer indicate, during the latter season, additional powerful agencies, in the enormous amount of vegetable and animal life inhabiting this water, which co-operate in consuming the effete matter with surprising rapidity.

2. These last two agencies are unreliable, and may at any time fail us. It is probable that the limit is even now about reached, at which the excess of material for the nourishment of these beings—or rather, the inevitably poisonous products of the putrefaction of this excess—will engender all at once some deadly epidemic, or rather *epi-ichthyc* disease, which will destroy the fish, as is well-known to have always resulted, sooner or later, in similar cases.

3. The analysis of Jersey City reservoir water of August 9th, shows that even now there are times when these consuming agencies fail to come fully up to the mark, so that the average of putrefiable matter in the water, as distributed to consumers, rises to a proportion that should cause deep disquietude.

4. The large indications of matter of animal origin in solution at low-tide at the Newark pumps at Belleville, overthrows the plan brought forward in the chemical report of last March, that the water be conveyed to the pumps from a point higher up the river.

5. The water above the Falls at Paterson does not present, at least in summer, the purity that appears desirable in a water-supply to be selected and adopted for all time—especially when it is remembered that the main Passaic receives a large and constantly increasing amount of drainage from towns, country, and factories, as well as much swamp-ooze.

6. The Morris canal, on the long level, above Paterson, extending to Bloomfield, much excels in purity the water above the falls at Paterson (See Table VI.), containing but about one-half the vol tile matter, nitrates, animal matter and chlorine.

7. Were the incessant surging against the banks of the canal, by passing boats, to be stopped, its water would quickly assume a limpidity or clearness equal to that of the river above the falls.

8. The canal feeder at Pompton Plains, which is capable of draining more than one-third of the whole Passaic water-shed—and which comes down from a country very little cultivated and sparsely settled—brings water which is far beyond that of Passaic Falls in purity; the amount of total solids in the feeder to that in the upper Passaic being as 1 to 1.38, the amount of nitrates as 1 to 2·4, and the amount of chlorine as 1 to 2·17.

9. Were the main canal, above the Pompton feeder, protected from contamination by the towns and villages along the valley of the Rockaway, and its influx of water confined to the Hopatcong feeder and the Rockaway above Dover, it is probable, indeed reasonably certain, that its water would acquire a purity

* I am informed that this is the case also in Paterson, where similar dangers must be constantly impending—in view of the similar formations underlying that city even to an extent more marked than at Newark.

even much greater than that of the Pompton feeder.

10. Lake Hopatcong is scarce surpassed in purity by any mountain lake whose analysis is on record, being very closely equal to the celebrated Loch Katrine, thatsupplies Glasgow.

11. It may be accepted that the upper Rockaway, above Dover, coming from the same country, and fed moreover in port by Green Lake, 130 feet higher than Hopatcong itself, must be at least equally pure as the latter.

12. The combined water-shed of Hopatcong and the Rockaway above Dover, measures 72 square miles; equivalent to an average daily supply of at least eighty million gallons, or, say, in round numbers, 30,000,000,000 gallons per year of water ranking among the purest in the world.

13. Were a large reservoir constructed among the hills, somewhere about Boontoon or Montville, to which this water could be brought through the canal, from fifteen to sixteen miles of piping would carry it to Belleville, with a head sufficient to raise it to the highest parts of Newark, or of Bergen Hill and the Palisades.

14. At the same time the Pompton feeder could deliver, at Bloomfield, through the long level, for all business, steam and manufacturing purposes, such copious supplies of water, equal in purity to any river of equal volume in the United States—for example, of fully twice the purity of the Croton—that your cities would at once become—in this truest and most beneficent of all wealth of cities, quite as rich as Imperial Rome of old, in her halcyon days.*

15. In conclusion, taking in view all the results of my labors during the year past, in the field and in the laboratory, I cannot hesitate to announce, as my professional opinion, that if it is true that the opportunity now offers (as is stated to me) for your honorable Commission to convert the Morris canal from what is said to be an unprofitable channel of navigation, into a channel of pure water-supply for the great cities now growing up around us, this opportunity should be availed of immediately, without any dangerous delay.

All of which is respectfully submitted.

HENRY WURTZ.

* Rome, under the Emperors, when she was mistress of the civilized world, had a daily supply of pure water for every man, woman and child, of more than three hundred gallons.

Meeting of Gas Commissioners.

The Mayor, Comptroller and Commissioner of Public Works, commissioned by the Legislature to contract for the city's supply of gas, opened Saturday, February 8, in Mr. Van Nort's office, new bids for lighting, etc., public lamps above Thirty-fourth street. The proposals were not to include any part of the above district which has been awarded to the Mutual Gas-Light Company.

The following proposals were opened:

HARLEM GAS-LIGHT COMPANY.

For gas for each lamp	$39 00
For each lamp post straightened	3 00
For each column releaded	3 00
For each stand pipe releaded	4 00
For each lamp post removed	4 00
For each lamp post reset	10 00
For each lamp post fitted up	10 00

METROPOLITAN GAS LIGHT COMPANY.

For gas for each lamp	$33 00
For each lamp post straightened	3 50
For each column releaded	3 00
For each stand pipe refitted	4 00
For each lamp post removed	5 00
For each lamp post reset	12 00
For each new lamp fitted up	12 00

The awards will be made in a few days. Sureties will have to be filed for the faithful performance of the contract agreed upon, to the amount of $100,000. —*N. Y. Herald.*

Water Items.—The Water Board of Yonkers contemplate a storage reservoir on the Grassy Sprain of 20,000,000 gallons' capacity, and another on the Sprain of 67,000,000 gallons' capacity. For the two reservoirs 69 acres of land will be required, and the cost of the work is estimated at about $780,000.

FLUSHING.—The estimated cost of introducing water into the village of Flushing by the Holly system, is from $125,000 to $300,000, in addition to the cost of the sources of supply, $35,000. The matter of the awards for lands taken is still before the courts.

Chemical Repertory.

No. 106.—March 2, 1874.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

1023. ARTIFICIAL FUEL.—The object of the invention of Mr. W. Hadede, of Buckingham Palace-road is, firstly, to improve the manufacture of artificial fuel in general, and also to improve the manufacture of artificial fuel which will rapidly harden thoroughly. Coal dust or slack is compounded with silica in a soluble state (furnham earth), lime, clay, chalk, and a solution of silicate of soda or potash, which has previously been thoroughly neutralized by baryta; the compound is then compressed in moulds, and after having been freed from the moulds it is allowed to harden by the action of the atmosphere, which it does rapidly, and in almost any state of atmosphere.

1024. HEATING STREET CARS WITH PETROLEUM.—The latest "new use" to which petroleum is applied, as we learn in the news from the oil-regions, is heating the street cars of New York. The Fourth avenue cars are being supplied with little stoves which use petroleum for fuel, and keep the passengers comfortably warm. Just how it works is not yet known, as the first one has not exploded yet. We have little doubt, however, that our insurance exchanges will shortly get an item and a text from this direction.

1025. GREASE SPOTS.—In the removal of grease from clothing with benzole or turpentine, people most generally make the mistake of wetting the cloth with the turpentine and then rubbing it with a sponge or piece of cloth. In this way the fat gets dissolved, but spread over a greater space and not removed; the benzole or turpentine evaporates, and the fat covers now a greater surface than before. The only way to radically remove grease spots is to place soft blotting-paper beneath and on top of the grease spot, which spot has first been thoroughly saturated with the benzole and then well pressed. The fat gets now dissolved and absorbed by the paper, and entirely removed from the clothing.—*Scientific American.*

1026. COAL IN GREECE.—Mining operations in Greece, says the *Levant Herald*, are making steady and lucrative progress. The coal produced by the Hellenic Mining Company from its mines at Cumi find a ready market at the Piræus, where it is used in the different steam factories, and a trial having been made on board a government steamer, this coal gave excellent results. It is now announced that the company has entered into a contract with the Austrian Lloyds for the supply of a quantity of this coal, sufficient, for the present, for the line of steamers running between the Piræus, Syria, Smyrna, and Candia, and that, later on, the Constantinople line will be supplied with fuel from the same source generally. The Cumi coal is mixed with Newcastle coal in the proportion of three parts to one.—*Iron.*

1027. COAL IN NEWFOUNDLAND.—The announcement is made of the discovery of an extensive coal field at St. George's bay, Newfoundland. It has been ascertained that several workable seams of superior quality exist there, the extent of which can only be determined by boring. Much of it appears to be cannel coal of a description much sought for in the manufacture of coal gas. This is, however, not the only coal region of Newfoundland. On the north-eastern shore of Grand lake are found precisely similar beds to those forming the south side of St. George's bay. Here the existence of a three-foot seam is reported, and the opinion is expressed by eminent judges that coal may be found over the whole or a greater part of this region. It is likewise probable that large deposits of magnetic iron ore will be shortly brought to light in this portion of the territory.—*Amer. Exch. and Review.*

1028. ELECTRIC LIGHT.—Previous to the Franco-Prussian war, the St. Laurent, of the French line, was fitted with electric lights of great power, which were plainly discernible for many miles at sea. At the beginning of the war this light was taken from the steamer and used by the government for harbor defence, and has not since been used at sea. The managers of the French line are now considering the propriety of providing all their ships with lights of this description, which would, except under circumstances most unusual, render a collision impossible. The substitution of life-rafts for life-boats is also under consideration.

1029. SUBAQUEOUS GAS-STOVE.—Samuel H. Starr, Philadelphia, Pa., has patented a stove to be sunken in the liquid to be heated, which has an air tube opening into an air-chamber, which underlies the entire base of the stove, and has orifices in its top for emission of air to the gas-jets. A gas-tube follows the inside of the air-tube and air chamber; fits an opening in the top of the air-chamber, and so conducts gas into a gas-chamber, from whose dome-shaped cover gas is emitted in jets, and is fed by air from the underlying air-chamber. Flame is applied to the top of the smoke-pipe, whence it is borne to the gas jets in the body of the stove.

1030. "WHITE COAL."—A new kind of fuel has recently been discovered on the Australian continent, which has received the name of white coal. It consists of felted vegetable fibers, like peat, which contain, interspersed between them, fine grains of sand. It is easily combustible aad burns with a light flame. The white coal covers large tracts, requiring no mining, and is already used in large quantities as fuel.—*Scientific American.*

1031. ENGLISH GAS TROUBLES.—*Iron* tells us that Brighton is quarrelling with its gas, which is said to have come down in quality as it has gone up in price. Moreover, it is asserted that double the quantity, as compared with last year, is registered as passing through the meters, even where no increase has been made in the lighting or heating.

1032. FROM THE KANAWHA REGION.—The *Engineering and Mining Journal* says that at Hawksnest the Gawley Kanawha Company is grading roads and opening mines. It is said Prof. Ansted's plan of opening mines is by means of a shaft to let the coal down from the upper to the lower vein, from which a tram-road, with a grade of over 200 feet per mile leads to the C. & O. R. R. We have heard it stated that the Professor proposes to keep the shaft full of coal, filling in at the top as it is drawn out at the bottom. We don't know the depth of the shaft, but it is quite considerable, and we doubt, if this be the plan, it will be found more satisfacaory on paper than in practice. There are some other expectations of this company, which appear as of difficult realization in practice.

1033. SANITARY.—At the annual session of the American Public Health Association, which took place in November, the President of the Association, Dr. Stephen Smith, said: "There never was a time when the people were so thoroughly aroused to the importance of sanitary measures, considering the methods of prevention of malignant types of disease; and efforts are making to secure pure air and pure water. Could these two essentials to good health be assured to all, typhus fevers, diarrhœal diseases, consumption, and other affections would be greatly ameliorated if not entirely eradicated. Good drainage is also exciting much public interest, and it is regarded as a necessity that every dwelling should have a dry cellar and perfect drainage.

1034. USE FOR GAS-CARBON; VOLTAIC BATTERIES.—In an Austrian journal we find a description of a battery made by Fein, in Stuttgart, which is said to

combine great electro-motive force with great constancy. It consists, in the first place, of a three-necked bottle, like a Woulfe's bottle. In one of the side necks is a carbon rod, and in the other is an amalgamated zinc rod, provided with a cotton cover as substitute for a porous cell. The bottle is filled through the middle neck to two-thirds its capacity with a mixture of black oxide of manganese and pieces of gas carbon; the remaining third is filled with a concentrated solution of sal ammoniac, and so placed that the mouth of the flask dips beneath the surface of the solution in the bottle.

1035. Wasting the Gifts of God.—The barbarous and beastly waste that goes on in *our* mining regions, of treasures entrusted to us—insomuch that the purest part of our anthracite is held as cheaper than dirt, and used to make railroad embankments and to fill in waste ground—for which "the sins of the fathers" will be "visited on the children"; is paralleled in Great Britain even on a still larger scale. *Iron* says that Mr. Parton, F.G.S., read a paper at Dudley, on the subject of economic coal mining, in the course of which he mentioned the somewhat startling fact that in many cases the ordinary waste and loss in working a colliery, owing to the imperfect methods adopted, is not less than forty per cent., of the coal measures, while under favorable conditions the loss sustained is not more than ten per cent.

1036. Noxious and Explosive Atmospheres.—A safety apparatus, known as the Aerophane, or Denarouze mining apparatus, has recently been experimented upon by the British inspectors of mines. It is claimed to be the most efficient apparatus of its class thus far devised. By its use, and encumbered with a weight of no more than eight or ten pounds, it is said that a man may penetrate at once and to a great distance into a pit filled with choke damp, or with smoke, or with any other noxious gas, remain there for several hours, carrying at the same time a lamp with complete impunity. The machine, which has received a thorough test in the mines of France, Switzerland, and Belgium, will be tested in the English Wigan coal field, which, from the dangerous character of the mine, will afford an excellent opportunity for testing the practical value of the apparatus as a protection to life and property.—*Amer. Exchange and Review.*

1037.—Chemical Prizes.—We select from the list of prizes of the French *Societe d'Encouragement* the following, offered for chemical discoveries, with the years appended in which they are to be awarded:

Best commercial process for the preparation of oxygen gas, 2000 francs, 1874.

Industrial application of oxygenated water, 2000 francs, 1878.

Economical production and application of ozone, 3000 francs, 1875.

Fixation of atmospheric nitrogen, either as nitric acid, ammonia, or cyanogen, 2000 francs, 1876.

Artificial production of graphite, suitable for lead pencils, 3000 francs, 1877.

Artificial preparation of a compact black diamond, 3000 francs, 1877.

Artificial preparation of the fatty acids or of matters allied to wax, 4000 francs, 1874.

Disinfection of gas-residues, 3000 francs, 1874.

Disinfection and prompt clarification of sewage, 1000 francs, 1875.

Ink not attacking metallic pens, 1000 francs, 1875.

1038. Heat and Human Life.—During the reheating of the furnaces in an iron establishment in England, says the *British Journal of Science*, the men worked when the thermometer (Fahr. of course), placed so as not to be influenced by the radiation of heat from the open doors, marked 120°. In the Bessemer pits the men continue a kind of labor requiring great muscular effort at 140°. In some of the operations of glass making the ordinary summer working temperature is considerably over 100°, and the radiant heat to which the workmen are subjected far exceeds 212°. In a Turkish bath the shampooers continue four or five hours at a time in a moist atmosphere at temperatures ranging from 105° to 110°. In enamel works men labor daily in a heat of over 300°. (?) On the Red Sea steamers the temperature of the stoke hole is 115°. And yet in none of these cases does any special form or type of disease develop itself.

American Water-Gas Researches.

REPORT OF PROFESSORS SILLIMAN AND WURTZ.

[Continued from page 58, No. 4.]

EXPERIMENTAL RESULTS OBTAINED WITH VARIOUS COALS BY THE GWYNNE-HARRIS PROCESS.

The daily record embodied in the Tables at the close of this report gives the data for a considerable variety of calculations. But we propose to give in this chapter specific statements of the results obtained by us at Fair Haven, in operating upon a variety of coals and materials by the hydrocarbon process, and to bring these results into contact with each other, as well as with those obtained from the treatment of the same materials by the common process.

WESTMORELAND COAL.

This coal is from Western Pennsylvania, in the Pittsburgh basin, and is in great favor among gas engineers, in the United States. It has been the basis of our hydrocarbon experiments at Fair Haven, for reasons already stated.

In the dry way, by ordinary process, this coal yields on an average sample as follows:

Charge, 224 pounds, carbonized

3 h. 20 m. produced per ton.....9,500 cubic feet.
Illuminating power, standard Argand.16.62 candles.
Weight of coke, per ton.....1,544 pounds.
Bushels of coke, per ton..... 40
Maximum yield of gas per ton.....10,642 cu. ft.
One bushel of lime purified*..... 6,420 cu. ft.

Analysis of the coal:

Volatile matter.....36 per cent.
Fixed carbon.....58 per cent.
Ash..... 6 per cent.

100

Value of the gas from one ton estimated in pounds of spermaceti...=541.26 lbs.

The above results were obtained in the experimental works of the Manhattan Gas Light Company, New York, where the daily average yield of gas from this coal and its equivalent the "Penn" is about 10,000 cu. ft. of 15 candle gas.

At the New Haven Gas-Light Company's works, where this coal is used alone for the four summer months, and with the addition of 5 per cent. to 6 per cent. of albertite during the remaining eight months, the average yield of gas for the whole year 1868 was..... 4·11 cu. ft. per lb.
Or, to the ton of 2,240 lbs..... 9,206 "
Of an average candle power of.....18 candles.
Giving for the value of one ton.....568 lbs. of sperm.

An examination of the results recorded in our tables C and D will show the product of the Westmoreland coal with 10 per cent. of albertite added, when treated by the hydrocarbon process, from January 27, to February 12, was as follows:†

Average yield per lb..... 6·34 cu. ft.
Average yield per ton.....14201·6 "
Illuminating power..... 20·72 c'nd'ls
Equal in pounds of sperm for 1 ton...1,008·95 lbs.

From the 29th—31st of March, returns of Table D, the Westmoreland coal *alone* was treated by the hydrocarbon process, at Fair Haven, giving the following results:

Average yield per lb. of coal carbonized... 6·27 c. f.
" " " ton " " ...14·057 "
Illuminating power of 5 cubic feet of gas burned in standard Argand.....16·55 c'dles.
The gas from one ton of the coal by the hydrocarbon process is equal in lbs. of sperm to.....797·634 lbs.
From the ordinary process we have above.541·257 lbs.

Giving gain for the hydrocarbon process..256.377
The ratio of gain in total economical effect is therefore as 100 : 147·79, or in percentage..... 47·79 p. c.

The illuminating power in these two cases was substantially identical.

No enriching coal whatever, it will be remembered, was used in this trial. The result is certainly sufficiently remarkable as coming from a caking coal. It is worth while to bring the gas produced in the two cases, of equal candle power, into direct contrast, as follows:

Gas from one ton Westmoreland by the hydrocarbon process.....14,057 cu. f.
From one ton, common process..... 9,500 "

Gain in gas by hydrocarbon process..... 4,557
Corresponding to a gain by this mode of statement of ..... 47·97 p. c.

This is what gas-makers will consider as the *practical* difference, while that exhibited by the value in pounds of sperm is the true *economical* difference, viewed from the side of the consumer.

EXPERIMENTS WITH ROSIN, AS THE ENRICHING MATERIAL.

a From December 1st to 28th, inclusive (see table A), the gas made by the hydrocarbon process at Fair Haven was from:

Westmoreland coal..... 95 pr. ct.
Rosin..... 5 "

The amount of gas registered at the meter was 353,600 cubic feet, or 6·04 cubic feet per pound; and with the proper corrections for contaminating air, this amount was reduced to 5·56 cubic feet. The account stands thus:

58,800 lbs. coal and rosin gave gas.....363,600 c. f.
Equal per lb. to..... 6·0 1
" " corrected for air..... 5·. 3
Observed candle power, average..... 15·67 c'd ls
Corrected " " " 19·67
One ton gave gas, corrected for air..... .12,454·4 c. f.
" Westmoreland coal and 5 per ct. albertite, at New Haven works, common process, gives..... 9,206·0 c.f.

Gain in volume by hydrocarbon process.. 3,248.4
Gain in percentage of gas..... 34.55p. c.
Illuminating power substantially alike.*
Value of one ton of this mixture by the hydrocarbon process in terms of spermaceti..... 840·20 lbs.
The same by ordinary process..... 568 "

Gain in total economic effect..... 272·20 lbs.
Percentage gained by hydrocarbon processs in total economical effect..... 47·92

b. From February 13th to 28th the gas was made from:

Westmoreland coal.. ..... 90 p. c.
Rosin..... 10 "

24,160 pounds of this mixture gave by the hydrocarbon process,

Gas..... 159,600c. f.
When corrected for air equal per pound.. 6·14 "
2,240 lbs. (1 ton) give therefore..... 13,753·7 "
Illuminating power (corrected)..... 21·08 c'dls
" " of 5 per cent mixture (*a*)..... 19·67 c'dls

Gain equal 7½ per cent. over the 5 per ct. mixture, or equal..... 1.49 c'dls
Total economical value of one ton of this mixture in lbs. of sperm..... 997·8 lbs.
Economical value of the 5 per cent. mixture (*a*) equal..... 840·20 lbs.

Gain by addition of 5 per ct. more rosin. 157·60
" " in percentage..... 18·75 p.c.

This trial shows that the Westmoreland coal, with 10 per cent. rosin added, gives almost exactly the same total economical effect by the hydrocarbon process as was obtained from the same coal with 10 per cent. of albertite, being a difference of only 11 lbs. of sperm in favor of the latter mixture.

As there are many situations in this country where

* It is worthy of remark that in carburizing over 6,000 tons of Westmoreland coal at New Haven in 1869, the lime required for the purification was almost exactly 1 bushel to 6,000 cubic feet.

† These results are reduced to the true yield by subtracting the air found by analysis as an impurity, and correcting the candle power accordingly.

* With 5 per cent. albertite, the New Haven gas ranges from 18 to 20 candles, averaging 19. With Westmoreland alone, it is about two candles less.

rosin is the cheapest and most conveniently obtained of all enriching materials, it is satisfactory to know that its value, when used in connection with common caking coals, is such as to equal the albertite as an enriching matorial, while in the situations alluded to its cost is much less.

It will be remembered that in the early experiments on White's process in England, it was especially adapted to making rosin gas. The results here given must not be confounded with those then obtained. By our plan of proceeding, the quantity of rosin employed is restricted to 10 per cent., and this gives excellent results in every way. The coke is uninjured; no accumulations occur in the stand-pipes or hydraulic main; and the gas is completely purified, without using the washer, by the dry lime purifiers only.

BLOCKHOUSE COAL, COW BAY, NOVA SCOTIA.

This coal, owing to its nearness to the northern ports of the United States, its fair illuminating power and good gas-producing qualities, is well esteemed by some of our gas engineers. Good cargo samples of this coal make, by dry process, from 9,500 to 10,000 cubic feet per ton, of a candle power from 16¼ to 17¼ candles. But we have found it quite variable in quality, producing gas sometimes of only 15 candle power. It is quite sulphurous, one bushel of lime purifying only from 2,000 to 2,500 cubic feet of the gas.

A small sample of six tons, obtained for the purpose of testing the coal by the Gwynne-Harris hydrocarbon process, reached us in very bad condition, wet and much comminuted, and the following results cannot be considered, therefore, as a fair criterion of what may be expected of it when a good sample is tested.

By the hydrocarbon process, the Blockhouse gave the following results when treated alone:

4,200 lbs. of coal made.....23,600 cubic feet of gas.
Yield per pound.....5·62 " "
" " ton.....12,589 " "
Illuminating power.....14·08 candles.
Value of one ton in pounds of sperm.....607·72
In another trial, with 10 per cent, of albertite added 6950 pounds of coal made.....39,300 feet of gas.
Yield per pound.....5·65 cubic feet.
" " ton.....12,656 "
Illuminating power.....15·75 candles.
Value of one ton in pounds of sperm.....683·42

Giving a gain in total economic effect of 33·22 per cent. by the hydrocarbon process.

ALBERT COAL—"ALBERTITE."

This very remarkable material from New Brunswick is too well known to all gas engineers in the Eastern United States to require any description here. Its almost complete freedom from sulphur and from ash, and its very large yield of rich gas, make it the most highly esteemed of all the enriching materials at present available for gas-making in the eastern portion of the United States. Unlike most cannels, its use does not sensibly impair the value of the coke produced; while it imparts, even in quantities as small as 5 per cent., a very satisfactory quality to the gas from common caking coals. It is not well-suited to carbonization alone, owing to its highly inflammable nature, in which it resembles asphaltum. But we have obtained some results with it by the hydrocarbon process which are hereafter given.

The following results on its gas-producing powers by the common process were obtained at their experimental works by the Manhattan Gas-Light Co. in New York:

Weight of charge per retort, 224 lbs. Time of carbonizing, 3 hours and ten minutes.

Yield of gas per ton of 2,240 lbs., 14,784 ft. (equal 6·6 ft. per lb.) Illuminating power of 3 cubic feet burnt in a Scotch tip fishtail, 29·74 candles, equal per 5 cubic feet, to 49.55 candles.

Yield of coke, per ton, 16·8 bushels.
Weight of coke, per ton, 806 pounds.
Gas perfectly purified by lime.
The coke burns well and rapidly, without clinker.

ANALYSIS OF COAL.

Volatile matter	57·70
Fixed carbon	41·90
Ash	0·40

We deduce from this the value of one ton in lbs. of sperm equal 2511·57 lbs.

(To be continued.)

It is Calculated that it would require ten times the number of wells to be sunk in Butler county in 1874 that were sunk in 1873 to produce the same amount of oil. The limits of the two belts are now clearly defined, and the fourth sand only exists where the belts cross.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

Burning Tar for Fuel.

GAS WORKS, MONTREAL, Feb. 9, 1872.

MR. EDITOR: Although I incidentally mentioned my intention of penning a few remarks on burning tar as retort fuel, (suggested by the interesting letter from Mr. Nettleton thereon, in a preceding number) in one of my letters on another subject, which you were good enough to insert in the Journal a short time ago, I had resolved to abandon the intention, owing to the matter having been since so fully and ably discussed in the several communications that have appeared in your pages. But as my friend Mr. Littlehales, of Hamilton, in his contribution to the discussion in the last Journal, introduced my name in connection with the subject, in, I fear, too flattering terms, I have been induced to offer the following observations as my quota to the discussion.

I may mention that I have had a good deal of experience in burning tar for heating retorts, having so used it on and off for a long time, sometimes having had half a dozen fires in operation at a time. I had seen retorts so heated, in several places before I had any personal experience with it, and know it was thus used many years previously. But so far as I am aware, it was always burnt in addition to an ordinary coke fire, being simply run into the fire by means of a spout—usually a short piece of angle iron—laid slantingly in a hole cut through the front wall of the oven, just over the furnace frame, the hole being large enough to admit sufficient air to burn the tar. There was often, to, a small stream of water run in with the tar, this being, I presume, to assist the combustion by its decomposition. But as the tar fell from the spout in the contracted stream, the difficulty or rather, impossibility, of volatilizing it all will be apparent, as will also be the fact of a constant issue of dense smoke from the chimney top; and large hard lumps of baked tar accumulated in the furnace, known in retort-house nomenclature, as "horse's heads", and which had frequently to be broken up by means of a long chisel bar, and the lusty application of a sledge hammer, before they could be got out through the furnace door opening. There was also great destruction of the spouts or troughs, whether of wrought or cast iron, through their inner ends burning away. To obviate this last objection, Mr. John Ohren, then engineer of the Longton Gas Works, England, about six years ago, advantageously applied the principle of the tuyere as in a blacksmith's bellows nozzle.

To burn tar with entire success, it requires to be *spread out* on a sloping *hot plate*, in the manner patented by Mr. George Anderson, Gas Engineer of London, some twenty years ago, to which furnace Mr. Nettleton's seems to bear a resemblance; but I must be candid enough to say, and I am sure Mr. Nettleton will pardon my saying it, that I do not think his furnace is quite so perfect as Mr. Anderson's. Mr. Nettleton runs the tar on a sloping fire tile built into the front wall of the oven, just above the furnace frame, but my experience leads me to object to its not extending far enough into the furnace, and also to its being too fragile to stand the rough hammer and chisel work, indispensable in sometimes removing the accumulation of burnt tar on it. I would also infer that a portion of the tar finds its way into the fire below in an unconsumed and incandescent state as described above, and that a portion also leaves the chimney top as black smoke. His principle is right as far as it goes, but in my opinion it does not go far enough to secure the attainable economy in the consumption of the tar, and to obviate these objections.

Mr. Anderson's furnace is also a sloping table of fire tiles, extending in width to the full distance between the bottom retorts, against which the tiles jamb, and are supported on a half brick arch, thus making an exceedingly substantial structure. This sloping table projects 14 inches from the face of the front wall of the oven, and terminates within 9 inches to 12 inches of the back wall of the furnace, which is of the usual length. There is a perforated door in the pit or opening under the sloping arch, which, together with the tile bedded also on it, are kept hot by the burning of the fine breeze from the tar, which slides over the back or lower end of the table into the pit below, forming a heap, and is burnt by the indraught of air through the pit door perforations passing through it, for which purpose it is kept banked up close to the arch. The highly heated products of combustion ascending therefrom, through the space between the end of the table and the back wall of the furnaces, completely burnt up any unconsumed tar that might pass off as smoke, and assist in heating the retorts. The opening in the front wall above the sloping table, for occasionally cleaning off any accumulation of baked tar on its surface (and which is pushed over into the pit), is filled in with loose fire-bricks to prevent the admission of too much air.

I had several years continuous experience of this furnace, sixteen or seventeen years ago, while manager of the Dover Gas Works, for the lessees Mr. Anderson and his partner, and from experiments made over and over again, it was found that from 70 to 75 gallons of tar effectually heated each bed of six retorts, without the production of smoke.

Finding, however, that the successful working of the furnace required experienced manipulation, I was led to adopt a modification, by adding a breeze fire with fire bars in the usual way, under the sloping arch, which arrangement is much easier managed by inexperienced hands, and I believe gives still better results, with but a trifling consumption of breeze, which generic term comprises the droppings of the coke fires into the ash pans, unsaleable cannel coke or refuse, and the fine breeze left from the coke heap; and this arrangement I have successfully worked ever since, when having occasion to burn tar.

The difficulties in burning tar are not, as one of your correspondents believes, in the impossibility of obtaining heat enough for the retorts, but rather in preventing an excess of heat—not so much for the retorts, as that can be to a great extent advantageously met by charging them oftener—but for the supporting brickwork; and also in the waste of tar and consequent issuing from the chimney or chimneys of dense volumes of black smoke, which is an intolerable nuisance to the neighborhood, both of which serious evils result from running in too large a stream of tar. And this undue destruction of the settings would, I fear, take place, by burning the two in conjunction with a jet of steam, as recommended by Mr. Littlehales, and practised for some time by Mr. Walker of Milwaukee, who instances as a proof of the success of the plan in heating a bed of five retorts, that it *melted them down*, which reminds one of the "successful" experiment of feeding the horse with sawdust, only that the horse died during the experiment.

Mr. Nettleton's ingenious contrivance for "grinding" the tar, is doubtless an improvement when tar is thick or dirty, and when consequently a constant stream would not otherwise be obtained *fine* enough, and in such instances will no doubt be found to be an important advantage. But as Mr. Anderson explains in a letter in the last issue of the English *Journal of Gas-Lighting*, bearing on Mr. Nettleton's letter describing his contrivance, which appeared in a recent number of that journal, the necessity for such a contrivance is mainly owing to pumping up cold tar from the well, which in addition to its being too thick to run in a fine stream, usually contains lumps and dirt, in a greater or less degree. The better way is to prevent the overflow from the hydraulic main flowing to the well, by diverting it into an overhead tank, in the manner described by Mr. Anderson, and also by Mr. Spencer in your last Journal; and as Mr. Anderson explains, this tank cannot be too large, so at to ensure its contents being sufficiently homogeneous anp fluid. It is well too, to fix a filter in the tank (which

of course must be closely covered to prevent dust getting in), and the pipe conveying the tar to the furnaces must not be placed so as to get too hot, or there will be as much trouble as when the tar is thick. If this plan be adopted, and the eduction pipe be placed some little distance from the bottom of the tank, to be above the sediment which collects in the bottom, there will be but little trouble in the stream running fine enough. I have never had any difficulty in effectually carbonizing four tons of 2,240 lbs. of coal per beds of seven retorts in 24 hours, by the consumption of about seventy gallons of tar and some breeze, *and without producing smoke.*

Heating retorts by burning tar is not a question of the heating power of the tar, but is entirely a matter of expediency. Where tar is a drug and coke fetches a good price, there can be but one conclusion as to the course to adopt. But where both find a ready sale, it then becomes a question of whether it is better to sell the tar or burn it, and so release a larger quantity of coke for sale.

In conclusion I beg to take this opportunity (although, perhaps, rather late in the day, and not bearing on the subject under consideration) of thanking Mr. Havens for his full and very courteous reply to my inquiries and comments, touching his retort drawing and charging machines, and which I hope, ere long to have the privilege of seeing in practical operation.

Yours truly,
E. S. Cathels.

Petroleum Gas.

Brooklyn, Feb. 6, 1874.

Mr. Editor: I ask your indulgence and pardon also. The first for forwarding such a long communication as the following must be—your pardon for not replying sooner to your comments on my previous article. Lack of time must be my excuse, and the last excuse will now apply for not giving you the data you call for.

No doubt the mass of your readers will recollect the intent of my letter to you, published December 16th, 1873, in which I claim that petroleum gas, as made by my process, is better and cheaper than any other gas, is practically incondensable, either by pressure or temperature; that it is 80 candle power and lighter than the atmosphere.

In answer to your editorial comments on my letter, I must repeat that I am ready to prove the statements I make. I have proved them to numbers of persons who are using my works; and to all other persons who desire to be satisfied I would suggest that they employ some expert, whose record is known (say yourself, Mr. Editor), to thoroughly examine and test scientifically, the results attained by me. I do not fear any such examination—in fact, court it; but really have not the time to devote to a thoroughly scientific, and consequently long and patient elaboration of points, which are as clear to me as the noon-day sun, and which, if published, without costing the inquirer something, would not be believed nor appreciated. Were I to engage an expert, his report, if favorable to my claims, would be controverted and disbelieved, on the ground that I, by paying him, had in some measure at least, biased the opinion given. So it will be seen that any statements made by me, or by an expert paid by me, would go for nothing.

To all who are investigating the matter with a view to giving the people "more light, and not so much gas" I would say: Inquire of those now using my process; and the testimony of those who have bought and paid for it, will be clearer proof than my assertions.

In reply to Mr. Allen's communication of 2nd January, I must settle his case in a paragraph, and by repeating my statement, "That the consumer demands a better light and more of it—not more gas." The statement that to have more light you must have more gas is absurd. The customers of the Citizens Gas-Light Company of Brooklyn, that Mr. Allen referred to confidently, as using his hydrogen process, don't say so. Witness the indignation meetings that have been held in South Brooklyn the past few weeks.

In answer to the article in your Journal of February 2nd, copied from the Titusville *Herald* please insert the following extract of a letter from Captain Butler, President of the Tidioute Gas Company, who is now using my process. The article was written in reply to a statement similar in character to the one republished by you, and is as strong an endorsement of Wren's Gas Works as can be written:

"Tidioute, December 24, 1873.

"*To the Editor of the Herald.*

"If * * * * there be found even in this day those so skeptical as not to believe (and yet so blind that they will not see), they can be convinced by visiting any of the numerous places where it is now in use. They will find unquestionable proof in New York city, in Brooklyn and throughout the State, in Connecticut, Rhode Island, Massachusetts, Maine, Ohio, Michigan; and this enumeration might be continued to include every State in the Union. Wherever illuminating gas is being used they are awaking to the great advantages of *petroleum* as a substitute for *coal* as a gas producer, and all the opposition of its enemies—and many there are right here in our mid-t—will not stay its rapid progress to general use.

"Please inform your readers that Tidioute has been lighted with petroleum gas since the 21st instant, and we *challenge* etc." * * * *

"M. H. Butler."

Wren's Gas Works at Titusville were erected for Gibbs, Sterrett & Co. to light their shops, and that the works gave perfect satisfaction the following letter of Mr. Gibbs to the *Herald*, contradicting a previous statement somewhat similar to the last, will show:

"*To the Editor of the Herald.*

"Having read this morning your article on "Petroleum *versus* Illuminating Gas," I would say in reply that I am surprised at the statements made in that article, and would like to know the sources from which you obtained such information in regard to making gas from petroleum oil, that would have a scale of hard carbon, as a deposit in the pipes which had to be bored out with a steel augur. Gibbs, Sterrett & Co. have made gas from petroleum oil for one year, and have this day examined the pipes, and find them free from any such deposit. I would like to know of a single instance where pipes using this gas gas have been stopped by such a deposit, so the public can ascertain for themselves the truth. I deny the article being true, in substance or in fact. I believe gas can be made from petroleum cheaper than from coal to produce the same light; * * * * *

"F. H. Gibbs.

"Titusville, January 18, 1873."

It is barely possible therefore that the rest of the statements, "That the apparatus by which the Titusville Gas Company intend to demonstrate the practicability of petroleum gas, does not interfere with any of the claims of existing patents," *may be a mistake.*

The Ashtabula Gas Company of Ashtabula, Ohio, is lighting that city with gas made by my process. Would it not be well to ask the President of that company to speak out and give his opinion of Wren's Gas Works.

Yours respectfully,
W. C. Wren.

Petroleum Gas.

Niagara Falls, February 10, 1874.

Mr. Editor: I see that the subject of petroleum gas is receiving considerable attention (as it should at this time), but am surprised at the many theories advanced, and experiments made with that end in view. When petroleum gas becomes a success it will be in its most simple mode of manufacture, which it seems to me that most Gas Engineers must or might understand. It matters very little to the practical man what statements are made as to the quantity and quality that is or *can be* made from a given amount of petroleum in any form, whether as gasoline, crude petroleum, or paraffine.

We all know that the carbon it contains is its light-giving power, and any mode by which this light-giving power can *all* be made available is a success, so far as the amount of light it can furnish is concerned, but the question of its economy depends on the manner of its production. In the employment of petroleum in any manner for production of gas, it must be vaporized, and that vapor must be converted into a fixed gas, and it seems to me that the cheapest and most simple mode of doing this is to have an ordinary refiner's still charged with petroleum, under which a fire is made of just sufficient power for vaporizing the material in its different degrees of density as distillation proceeds, until the entire liquid contents are driven off. Now, in an ordinary double bench of retorts this vapor can be introduced at one end of the retorts, and in its passage through to the stand-pipes at the other end, can be as thoroughly fixed as any gas can be, while its condition can be determined at all times by having a try cock on the stand-pipe, in easy reach of the attendant, the flow of vapor into the retort being governed by a valve in the vapor-pipe, outside of the mouth-piece, at the end of ingress. The pressure of the vapor in the still to be ascertained by means of a mercury gauge, which pressure need not exceed six inches, or fall below two. Now, suppose we have a bench of double end retorts, one half or more of the number in use for coal in the usual manner, the balance employed in fixing petroleum vapor, allowing it all to pass through the purifiers, though the petroleum gas does not need purification from sulphur, yet the lime serves the purpose of dragging out any atoms of tar, and prevents its lodgment in the mains or customers' burners.

It will be seen that by this *modus operandi*, almost any coal gas works can obtain the advantages to be derived from the employment of petroleum, without any change of construction, and can use as much or as little petroleum as may seem best, and always have sufficient coke for producing heats, heat being one of the chief items in the cost of the manufacture of gas, this heat item alone being sufficient to turn the scale in favor or against the employment of petroleum as a gas-making material; the heat and light for the manufacture of gas being secured at the lowest possible rate. Its volume is of secondary consequence, because that can be obtained from cheap materials—either low priced coal or hydrogen, or both.

As to any danger from the use of petroleum in gas making there need be none, because the stills must be outside the retort house, and all other houses, and be replenished by means of a force pump from a storeage under ground, and sufficiently distant to warrant security. Works of large dimensions would require two stills, in order to have one in service while the other was being cleaned and re-fitted.

Yours most respectfully,
Ananias Smith

Philadelphia, Pa., Feb. 12, 1872.

Mr. Editor: As a new reader of your valuable paper, allow me to express my thanks for your selections in regard to the "Economical use of Gas," and the statistics of the effect of using the "Scholl Perfector." Be kind enough to let me know if I can obtain them in this country, and if so, where.

Permit me to suggest your prompt advocacy of some plan by which the different gas manufacturing companies and inventors may prove their apparatus, and process of manufacture at the coming Centennial.

I see by the plan of the temporary buildings, that they seem to be well adapted for the purpose above referred to.

Very respectfully,
W. L. Bratton.

[Probably Mr. Cathels can inform our correspondent regarding the Scholl device.—Ed.]

Monongahela Gas Coal Co.—Abstract of Report and Analysis of Coal.

By Dr. Charles M. Cresson.

Amount of sample	60 lbs.
Volatile matter	35·74 per cent.
Coke	64·26 " "
Ash	6·66 " "
Gas, maximum yield, 5·2 cubic ft. per lb., equal to 11·648 cu. ft. per ton of 2,240 lbs.	
Gas, average yield, 5 cubic ft. per lb. equal to 11,200 cubic feet per ton of 2,240 pounds...	
Illuminating power—	
By Standard Argand, (Parliamentary) consuming 5 feet per hour, equal to	15 st'd'rd c'd'ls
One ton (2,240 lbs.) coal burned as candles 6 to 1 lb. equal to	576 lbs. sperm

Average of Penn Gas Coal burned as candles 6 to 1 lb. equal to..... 473·18 "
Value of sample for illuminating power compared with Penn gas coal as standard at 100, equal to 1.217.....
When the make of gas is limited to 4·35 cubic feet per lb. or 9744 cubic feet per ton of 2,240 lbs.
By standard argand, consuming 5 feet per hour, equal to..... 16·30st'rd c'dls
One ton (2,240 lbs.) coal burned, as candles 6 to 1 lb.....544·51 lbs sp'rm
Value compared with Penn gas coal as standard at 1,000..... 1·150

Remarks—

The sample is one of a few coals from which the maximum amount of gas can be driven off without greatly depreciating the value of the gas as an illuminator.

The amount of sulphur contained is more than is found in the Penn, Westmoreland or Youghiogheny coals; but is in such a form that a large percentage of it is retained in the coke. The amount driven off with the gas, being about the same as is driven off with the gas from Pittsburg coals, and much less than I have found with the Fairmount coal.

The amount of lime required for purifying should be about the same as is required for gas from Penn gas coal. The amount of gas purified by one bushel of dry lime should vary from 3,000 to 5,000 cubic feet.

As a fuel, the value of this coal ranks with the best Pittsburg.

For heating power—one pound of coal evaporates 14·41 lbs. of water.

The ash is grey, and consists chiefly (70 per cent.) of alumina, with silica; and contains but little iron, and does not readily form a clinker; and although voluminous, it is so finely divided, that a great percentage of it is carried off with the products of combustion.

Charles M. Cresson, M. D.
Philadelphia, Jan. 21st, 1871.

Letter from Dr. Charles M. Cresson, Chemist and Expert, to Thomas Gemmell, President Monongahela Gas Coal Company.

Philadelphia, Jan. 30th, 1874

Dear Sir: Yours of 26th is at hand. It is usual when examining coals, with references to their value for gas making, to ascertain the value of the whole of the gas capable of being evolved; and likewise the value of the gas when the production of gas is limited to the amount "worked off" at the heats and under the conditions usual in gas works.

The amount of gas had from gas coals, varies from 4 to 4·5 cubic feet, averaging about 4·24 cubic feet—say 9,500 cubic feet to the gross ton. The sample of coal sent by you, yielded considerably more than the usual average, both in quantity and illuminating power. In fact, when all the gas is obtained, if a 15-candle gas is desired, the coal is worth 20 per cent. more than Penn gas coal, in addition to the cost of enriching the latter one candle. And when a 16.30 candle gas is desired, is worth 15 per cent. more, *plus* the cost of adding 3·30 candle power. The cost of enriching 14 candle gas far more than balances the loss of the 1,300 cubic feet to the net ton, necessary to secure it—so that it will be much more profitable to use your coal, for the production of a rich gas, than to enrich the gas had from poorer coals—and if 15-candle gas is all that is desired, it can be had from your coal without enrichment, by the use of a little higher heat or longer duration of charge.

The sample of coal received from you is *first class* for gas or steam purposes. The coke is a good one.

Very truly, yours,
Charles M. Cresson, M. D.

Gas Matters in Wheeling, West Virginia.

[Communicated by Arthur Browne, Esq., Superintendent of the Wheeling Gas Works.]

[See Editorial page.]

To the Editors of the Wheeling Register:

The *Intelligencer* of the 27th ult., in reference to the question of an enquirer "G," "why can't we have better gas," editorially remarks "that," among other causes, "the method employed at the gas works are not such as are necessary to produce good gas." And again, that even after the proposed enlargement of the works, mains, etc., is made, "we shall still not have good gas till as much pains is taken with the quality as is now taken to make it measure well." Allow me, through the columns of your paper, to state that the method employed at these gas works is that which is almost universally approved and adopted, viz: Carbonization of the coal by "four hours' charges" and the purification by water, condensation and the hydrate of lime, for which method these works have been constructed by an engineer of well known ability. As to some of the so-called "modern improvements" in gas making, it would be easy to show that they are not only disadvantageous, but absolutely dangerous. It is quite true that in many places in Wheeling there is bad light from the gas, yet, at the same time, I assert that the gas is of a good quality. I am prepared to demonstrate by the proper photometrical test that it is 18 candle gas, and this is the only correct means for determining the illuminating power of gas. This statement will seem absurd while in some places the light from the gas is so poor. What is the cause? It is pretty well understood that while the increase in the consumption of gas in Wheeling has been recently very considerable—in the last few years it has been at least a third more—there has not been a proportionate enlargement of the street gas mains. Market street is poorly lighted, the supply of gas there last winter being quite deficient, more so than during any previous winter for some years. This is owing in a great measure to the McLure House having used the city gas; previously, for some years, it had manufactured its own gas. The gas service pipe from the main to this building is a large one—the size of the street main itself—and it is easy to understand that the McLure House—a lofty one—would draw away almost the whole supply in the street main; as coal gas, being about half the weight of atmospheric air, will naturally ascend. Last fall, foreseeing this disadvantage, I tried to obviate it by proposing that the city should rent the gasholder in the McLure House yard, which we could fill by day for the use of the hotel, and there by have the supply in the main for the rest of the gas consumers on that street; but the plan was not feasible, as Capt. McLure was about to sell his gas holder. I am aware that similar disadvantages exist in other parts of the city, but they are *not in all cases* caused *solely* by too small street mains or insufficient supply of gas. I can prove that the bad light, or as the "growlers" choose to call it "bad gas," is in many cases caused by worn out or partially stopped up burners, or by corroded or too small tubing in the houses. If in fitting up buildings for gas the scale as to the length and size of tubing and number of burners, as laid down by all gas engineers, a copy of which may be had *gratis* at the gas office, were adhered to, there would be fewer complaints about bad gas. Now, in addition to the information afforded by the *Intelligencer*, I beg leave to give a few facts, by mentioning a few out of many instances where this "bad gas" is chiefly attributable to a disregard of what is required by the scale above alluded to. First, the *Intelligencer* building, in all of its rooms and offices, extending from Main street along Quincy to Capt. Fink's store, almost half a square, the gas tubing is what is called $\frac{3}{4}$ inch, and there are about 30 burners, while by the scale there is allowed of that sized tubing only 20 feet, and to supply not more than three burners; but when the number of burners exceed 20 there ought to be some one-inch pipe. I once had some defective burners in the printing office removed and better ones substituted, which a printer said improved the light, but subsequently one of our employees found that the latter burners had been taken off and the former ones replaced. A gentleman of the firm stated the burners put on by us had been removed, because owing to some neglect of the employees they passed *too much gas!* and the same gentleman also stated candidly, that at his residence the gas light was very good.

There is another public building very badly lighted—Washington Hall. Some four or five years ago I ascertained that the burners on the chandeliers were only three feet burners, while the ordinary burner is a six foot burner, that is, consuming six cubic feet of gas per hour. The "arms" of the chandeliers, though tastefully ornamented, being little larger in calibre than a straw. I recommended the substitution of good burners, and had a man with the necessary tools ready to lay some larger pipe in the building, but a gentleman (one of the owners of the Hall, I understood) said he had purchased those burners especially for the Hall, and that as they afforded all the light needed, he did not wish them changed. Recently, when the new gallery was about to be erected, I was consulted as to the best means for improving the light in the Hall. I recommended the use, instead of a chandelier, of one of those fixtures called "sun lights" with reflectors, similar to those in some of the churches on Fourth street, and I would engage with such a fixture to light the hall well, even with the present supply of gas, but the chandeliers remain, and as a consequence the old cry of "bad gas" and "abominable gas" remains too. I can show in that building over 80 feet of $\frac{3}{4}$-inch pipe, of which size there ought not to be over 20 feet. By the use of bad burners a large per centage of the illuminating power of gas is lost. In Baltimore, it was shown in 1870, that over 61 per cent of the candle power of gas is lost from this cause. Another cause of bad light that may be noticed in some places in Wheeling, is *smoked and darkened walls and ceilings*. Mr. Robert Warrington, chemical operator to the Company of Apothecaries, London, England, testifies that from 20 to 25 per cent of light is lost or absorbed in such dark places. (See Croll's Report, page 265.) In many houses in Wheeling the gas tubing was introduced over 20 years ago, and it is reasonable to suppose that this old tubing must be partially stopped up. In the Messrs. Harper's hat store, on Main street, measures were taken recently, at my instance, to clear the gas pipe of supposed obstruction, and the result was a greatly improved light.

During the last winter a gentleman on Market street, between Monroe and Quincy, ordered his meter to be taken out, as he could not get gas-light enough for his office business. On examination, I found the gas fitting defective. I had the necessary improvement made, the meter was replaced, and he has since had sufficient gaslight to enable him to attend to the business of his profession. While insufficient or foul tubing and defective burners will cause very bad light, it by no means follows that the gas is bad. Good gaslight may be seen in some parts of the town, where there is the required pressure, and the gasfitting in the houses is properly executed. We cannot send out, at the same time, two kinds of gas from the same source of supply and through the same conducting tubes. It is therefore manifest that many of the complaints are caused by local defects. Further, it has been ascertained that from 12 to 50 per cent of light is obstructed by the use of glass globes; also, the state of the atmosphere has its effect on gas. Every mercurial inch diminution of the barometric pressure indicates five per cent loss of light, and the luminosity of gas varies with changes of temperatnre. A Berlin chemist has ascertained that at 32 deg. Fah. gas loses on an average 20 per cent. of its illuminating power; and recent experiments have proved that a New York gas lost by exposure to a cold of 6 deg. below zero, Fahr., some 35 per cent of its candle power. So a continued uniform degree of luminosity in gas cannot obtain. The exposure of a portion of the principal gas main on John street to the intense cold of last winter may have had a deteriorating effect on the gas.

An article headed "Shoddy Gas," taken from some Eastern paper, appeared in the Register a few days ago. The writer of that article was evidently ignorant of the subject. He says: "Assuming the specific gravity to be .5 and that of rich gas 7.20, the former will increase the bill of the consumer from 30 to 50 per cent." There never was coal gas made, the specific gravity of which was .5, much less 7.20. The specific gravity of coal gas is usually estimated in comparison with that of atmospheric air, which is taken at unity, and varies from 290.1000 to 750.1000, according to the quality of the gas, the former fraction indicating poor, the latter very rich gas. Assuming the figures quoted (.5 and 7.20) to have been intended for decimals, not integers, they would, provided there was no carbonic acid present, indicate gas of a rich quality—of 18 and 33 candle power respectively—*not* "shoddy gas"; but this difference in the specific gravity would not cause the alleged "increase in the consumer's bill of from 30 to 50 per cent." For as the flow of gas through any orifice is inversely as the square root of the specific gravity (other conditions being the same), the increase in the consumer's bill would, in the above case, be about 17 per cent. But whenever there is a disposition to assail the quality of the gas, the gas meter, etc., etc., there would seem to be a disregard for accuracy of statement. Our gas meters are, for the most part, dry meters, almost new, manufactured by the American Meter Company, and as regards accuracy in measuring, material and finish, they are at least equal to any gas meters made in this or in any other country. Arthur Browne, Supt.

April 4th, 1872.

The Price of English Street Gas.

An interesting letter from Mr. Wm. Morris, defending himself against a charge of "false calculations" presented to the Denbigh Town Council, appeared in a late issue of the *Liverpool Courier*. He says:

The street lamps are kept burning during the last three months of one year and the first three of the next. Each lamp is supplied with a 4 feet burner, and the gas company have placed governors or regulators in about one-half of the lamps engaged. The lamps are lighted and extinguished by the company's servants, and by a fair use cannot consume more than four feet of gas per hour. But, although not more than four feet can be fairly consumed, the late inspectors discovered that a sufficient quantity of gas was not turned on to burn even four feet per hour. The table below will plainly show what quantity of gas is consumed in the season:

	From	ft.
October	31 days.	7—12=5×31=155×4=620
November	30 days.	6—12=6×30=180×4=720
December	31 days.	5—12=7×31=217×4=868
January	31 days.	6—12=6×31=186×4=744
February	28 days.	7—12=5×28=140×4=560
March	31 days.	8—12=4×31=124×4=496
One lamp burns in the season		4,008
Number of lamps engaged		68
Total gas		272,544
Less moonlight nights, one-sixth off		45,422
Net gas consumed		227,122

These figures show a net consumption of 227,122 feet in the season of six months: for which £127 10s. was paid this year. If the quantity used as above be multiplied by 11s. 2¾d., it will amount to £127 16s., which proves that each 1,000 feet of gas cost 11s. 2¾d. It is not for me to make deductions in my calculations. However, as the company deny that they do charge, after making the deductions complained of, such as lighting, extinguishing, breakage, etc. The lamplighter is paid 12s per week for the lighting season of 28 weeks, for lighting, extinguishing, etc., and there are some hours remaining for employment each day at the gas works; this payment would amount to £15 12s. Allow towards breakage, painting, etc., £5 per annum. After making all the deductions, there would remain £100 18s., which shows that each 1,000 feet of gas, after making the deductions desired, cost the borough 9s. 5d. This price, I maintain, is unequalled in gas vending.—*R. R. and Mining Register.*

Coal-Tar.

The traffic in coal-tar is a comparatively new industry, and its growth has been very rapid. This is attributable to the many wonderful transmutations which have rewarded the chemical tests to which the substance has been subjected. From being considered but the worthless refuse resulting from the manufacture of gas, and of no commercial value whatever, it has within a few years attained an importance of no common order and the promise it affords of almost illimitable future development is evidenced by the fact that it is at present undergoing a wider range of experiments than any other crude material now serving as the subject of the analytical operations or as an ingredient in the compounding processes of the laboratory. In one of its varities it has proved a positive blessing to humanity; and did carbolic acid alone represent the sum total of virtue derivable from coal tar, still would this isolated fruit of the crucible well repay the time and toil expended in its discovery, and hold its place as one of the greatest material gifts of modern days. But the bituminous distillation flowing from the gas house retorts assumes other marked forms in the chemist's hands; and although these may not so directly contribute to the physical welfare of mankind, yet for certain purposes of utility they are unapproachable. Creasote oil, for instance, is certainly unequalled in its peculiar preservative qualities, which are none the less valuable because the revelation of those special properties is of comparatively recent date.

The United States government annually purchases thousands of barrels of this liquid, using it on all wood work exposed to the weather, especially on gun carriages; 120,000 gallons were employed in saturating the timber composing the bulkheads in the St. Clair Flats, Detroit river. It is extensively used by railroad companies for the preservation of railroad ties, bridge timbers, and piles, and also upon the blocks constituting the wooden pavements of Washington, Pittsburg, and other cities. The artificial oil of bitter almonds (oil of nurybane), of superior fragrance and flavor, is also extracted from the same viscid base, and is exclusively an American invention and manufacture. But the most remarkable product obtained from coal tar is the new article called anthracene, from which is produced the coloring matter known as alizarine, the identical substance which for two hundred years has been found solely in madder. It is only in the United States that coal tar has been made to yield anthracene in large quantities, several hundred pounds of which are daily manufactured in this country, and shipped to Europe on orders from the manufacturers of alizarine, which is not yet numbered among our domestic productions.—*Sci. American.*

[Regarding our contemporary's designation of anthracene as a "new article," and that its production from coal tar is peculiar to the United States, etc., we must beg to differ.—Ed.]

Legislative.—The Assembly Committee on Manufactures took up the Donohue Gas bill to-day (Feb. 4) and after a vote of the committee, which was unanimous in favor of the bill, fixed upon Wednesday next as the time for hearing any opponents of the bill who desire to address the committee.—*N. Y. Tribune.*

Mr. Daly introduced a bill (February 5) sent to him from New York, authorizing the Mayor and Common Council to manufacture gas for the city and its inhabitants; also a bill authorizing the city authorities to construct a rapid transit railroad and operate the same at the expense of the city.

Prof. Henry Wurtz,

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Publishing Office, No. 42 Pine Street.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH

At No. 42 Pine Street, New York.

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EDITOR---PROF. HENRY WURTZ.

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MONDAY, MARCH 2, 1874.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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COAL-ANALYSIS.

The mineral product which may be said to bear on its shoulders, like Atlas of ancient fable, the whole world of human industry—which furnishes indeed the force by which all other minerals are converted to the use of man, has probably received less attention from the analytical chemist than most other common minerals. The methods that have been generally applied to it in the laboratory, are rude and devoid of refinement. So true is this, that it may be asserted that while we know pretty well what coal will do, we do *not* yet know what coal is. Indeed, most of the so-called methods of analysis practiced upon coals have for their aim rather to determine what it will do rather than what it is made of. This is because we are all so directly and intensely interested in coal as an agent, and not as a material from which to obtain useful products. Hence most coal analysis has had until lately the almost empirical shape of determination of how much "volatile matter" it would give off; and it is only just now beginning to enter the public mind generally that much more is behind.

The truth is that the time is approaching when there will be a full and general recognition of the fact, that, in mere laboratory work, it will be found profitable to spend, in the investigation of a coal that is to be largely used, either for fuel or gas, or both—not merely a few hours, as a mere "crucible analysis" may require—or even a few days, as a conscientious chemist will demand—but as many *weeks* as we now use hours, or days.

In this place we must be content for the present with a mere announcement of this conclusion, one which, at an early occasion, will be enlarged on, developed and demonstrated in these columns. Our present space will allow but a brief comment on the methods at present applied in the analysis of coals.

Of these, we had, in the last issue, the pleasure of presenting the methods and practice of one of our most advanced chemists and experienced analysts, Dr. A. A. Hayes. We trust that all of our readers interested have not failed to read attentively this valuable paper. In the first part of the said paper Dr. H. treats of the effect of applying a slowly increasing heat to coal, which is of minor interest to gas men; but in the latter part he describes a practical method and construction of apparatus, involving much ingenuity, for reproducing, on a small scale, the actual conditions of the gas-retort, and—as we know from our own practice, with arrangements involving most of the essential features he describes, results may be thus obtained in the laboratory which are of substantial practical value in determining the value of a gas coal. One point our own experience leads us to suggest, as bringing us closer to the usual conditions of present practice. This is to remove the pressure from the thimble-shaped retort, by collecting the gas in a floating counterbalanced jar or receiver.

It must unfortunately be admitted that few coal-analysts, even at this day, go to the trouble to imitate so nearly the conditions of the actual gas-retort; and it is certain that, in America especially, most of the laboratory work on gas coals—even the determination of such simple points as the maximum volume and weight of gas to be obtained by laboratory methods—remains yet to be done. An unfortunate feature of one of the most really elaborate, and measurably valuable, series of coal-analyses we have—that of Prof. Wormley and assistants in Ohio—is that the determinations of volumes of gas obtainable, seem to have made by methods too imperfect to impart any importance to the resultant figures.

A SLIGHT UNPLEASANTNESS AT WHEELING.

Mr. Arthur Browne, Superintendent of the (Municipal) Gas Works at Wheeling, West Va., has sent us recently an account of a controversy, between himself and certain of the populace of that city, which, though it comes rather late in the day—its occurrence having been nearly two years ago—has lost little of its interest or applicability thereby. In these matters History repeats, and will often again repeat, itself. Mr. Browne, in sending the papers, says:

"If you think that they may interest some of the Gas Fraternity who shall experience similar attacks to those made on me, I should be glad that you would publish them."

As we do so think, though admitting that few readers will gather any novel information—aside from the bearing of the facts upon the general question of what may and does doubtless often arise from the appropriation of gas works by city corporations; a course which so many gas-consumers, on both sides of the Atlantic, have been brought to imagine will furnish a panacea for all their ills in this respect. With these apologetic observations, we shall therefore avail ourselves—in other columns—of one of Mr. Brown's letters to the public press of Cleveland, in defense of his own position in the matter.

It seems that subsequent to the assumption of the Gas Works of Wheeling by the city corporation, an increase of at least 33 per cent. of consumption occurred, without its occurring also to the Wheelingese that this would necessitate the remodeling of their whole distribution-system, already taxed in many places to its full capacity. These gentlemen have all heard of the difficulty that a camel would have in passing through the eye of a needle—no doubt many of them belong to that class to whom the saying was originally applied by its Divine Author—but that Mr. Browne, sitting in his office at the gas works, should not be able to reverse Nature's laws, and perform for them—by issuing an edict (as once tried by King Canute), or by some mystical "psychic force" which they have conceived him to control—should not be able to perform miracles, and make gas go hither and thither, just wherever it was wanted, throughout their labyrinth of pipes, without reference to the immutable laws which govern it in common with all God's other creatures:—this seems to have been a thing of which they neither knew nor recked. Let us hope that by this time they have found it out.

A thought that recurs in this connection—one that has often passed through the mind of the present writer—is that there is a great field here for inventors, in devising plans for obtaining and maintaining a greater uniformity of pressure throughout the street mains of a large city, by some self-regulating *automatic* device or devices. Why may not small gas-engines with exhausters, regulated automatically, be introduced at important points, in such manner as to supplement the original propelling force.

It appears to us that this class of problems is far from being beyond the reach of human invention; and that in this way temporary arrangements might often postpone for years the necessity for expenditure of large sums, besides averting discomfort from consumer and falling off of receipts from producer.

Hydraulic power, in most cities, might also be available in this way, without drawing on the gas itself.

SAWARD'S COAL-TRADE JOURNAL.

We seize the occasion of a change of title, on the part of this very valuable Journal, to pay our compliments, which have been justly due for some time. It has been known heretofore as the *Coal-Trade Circular*, but commences this, the sixth year of its publication, with the above amendment. This new name, as Mr. Saward says, is "more comprehensive, and in accordance with the character of the information presented." He moreover makes the modest, and fully warranted claim, that—

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A FRATERNAL GROWL.

On taking up the issue of our esteemed contemporary, the *Coal and Iron Record*, for February 7th, our first sentiment was one of elation, which suddenly sunk, however, into one of deep mortification. Elation first, because an original article contributed to our columns had been found worthy of transfer and occupation of the valuable space of our contemporary, mortification because the authorship of the article has been strangely credited *to the Editor of this Journal!* We refer to the valuable communication of Dr. Hayes, on "Cannelite," which has not been as widely copied as it ought to be (See issue of Nov. 16, 1873, first page).

In one of the opening sentences Dr. Hayes says:

"A few years since. Prof. H. Y. Hind and myself were engaged," etc. The *Coal and Iron Record* has it, "Prof. H. Y. Hind and Prof. Henry Wurtz"! Again Dr. H. says: The method pursued I shall describe"—the C. and I. R. makes it: "The method pursued, says Prof. Wurtz"!

It appears called for therefore that we should beg attention as prominently as possible, to this curious misapprehension.

THE "AMERICAN ARTISAN."

This Journal now reaches us as a Monthly Magazine, having altered its style the first of the year. It consists now of 32 large pages, very finely printed on heavy paper, with a splendid vignette of the East River Bridge. The numerous illustrations are of a quality in character with the rest, and, before all, the literary contents and character show a determination to occupy and hold the first rank among Journals of Technology.

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St. Louis, St. Louis, Mo.	Memphis, Memphis, Tenn.
Louisville, Louisville, Ky.	Philadelphia, Phil'a, Pa.
Boston, Boston, Mass.	Washington, Wash'n, D. C.
Baltimore, Baltimore, Md.	Chicago, Chicago, Ill.

And supported by the subscriptions of over three hundred others. 341

Retort Settings.

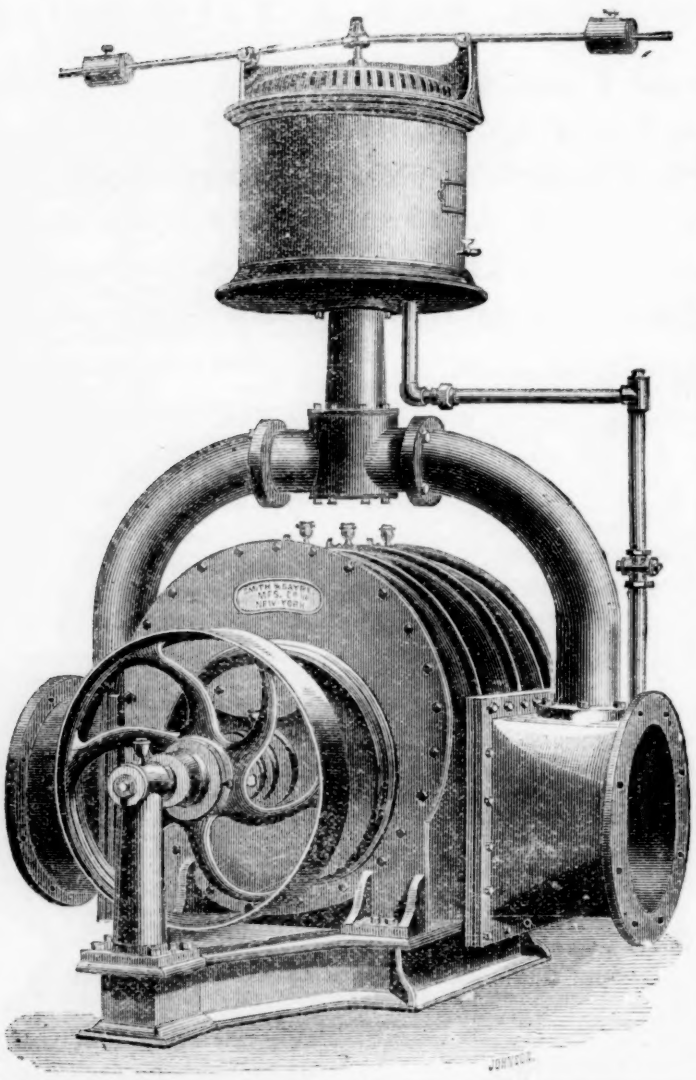
Mr. Cathels is prepared to supply Tracings of Detailed Working Drawings of his Improved Retort Settings (from one to nine Retorts in a bed), adapted for either Coke or Tar as fuel, showing Plans, Transverse and Longitudinal Sections and Elevations, easily understood by any Retort Setter or Bricklayer. These Settings are excellent gas producers, with great economy in fuel. For terms, etc., apply to E. S. CATHELS, Gas Works, Montreal, Canada.

"On the proper mode of setting the retorts the prosperity of a gas-light establishment mainly depends."—Vide Peckstone's Treatise on the Manufacture of Gas. 345

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan.

The Cupolas are manufactured in sizes to melt from 1 to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

JAMES M. SAYRE, Treasurer. J. G. PORTER, President.

CHARLES W. ISRELL, Secretary. OFFICE, 98 LIBERTY STREET, New York.

AMERICAN

GAS SCREEN MAN'F'G COMPANY.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces. the edges of the frame being grooved prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the creen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

The saving of lime and labor, as the Screens are not to clog, and are easily cleaned.

Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any her now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why ey will not last for a long time. The *very large amount of n space* in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years. and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respedtfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3. 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, beheving they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H, PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable. and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience.

Yours truly,
P. E. DEMILL. Secretary.

We give a list of some Gas-Light Companies using them.

Providence, R. I. Gas-Light Co., Boston, Mass. Gas-Light Co.: East Boston, Mass., Gas-Light Co.; South Boston, Mass. Gas-Light Co.; Springfield, Mass., Gas-Light Co.; New Bedford, Mass., Gas-Light Co.; Manchester, N. H., Gas-Light Co.; Reading, Penn., Gas-Light Co.; Biddeford, Me., Gas-Light Co.; Hartford, Conn., Gas-Light Co.: New Haven, Conn., Gas-Light Co.; New Orleans, La., Gas-Light Co.; Savannah, Ga., Gas-Light Co.; Charleston, S. C., Gas-Light Co.; Trenton, N. J., Gas-Light Co.; Charlestown, Mass., Gas-Light Co.; Dorchester, Mass., Gas-Light Co.; Chelsea, Mass., Gas-Light Co.; Baltimore, Md., Gas-Light Co.; Manhattan, N. Y., Gas-Light Co.; Cincinnati, Ohio.; Gas-Light Co.: San Francisco, Cal., Gas-Light Co.: Albany, N. Y., Gas-Light Co.; Sacramento, Cal.; St. Joseph, Mo., Gas-Light Co.; Leavenworth, Kansas, Gas-Light Co.; Macon, Ga., Gas-Light Co.; Roxbury, Mass., Gas-Light Co.; Lansinghburg, N. Y., Gas-Light Co.; Bridgeport, Conn., Gas-Light Co.; Stamford, Conn., Gas-Light Co.; Poughkeepsie, N. Y., Gss-Light Co; Scranton, Penn., Gas-Light Co.; Lewiston, Me., Gas-Light Co., and one hundred others.

Address **R. A. POTTER, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass
EDWARD DUFFEE, Agent.

AGENCY FOR

GIBSON'S IMPROVEMENT

IN THE

Manufacture of Coal Gas,

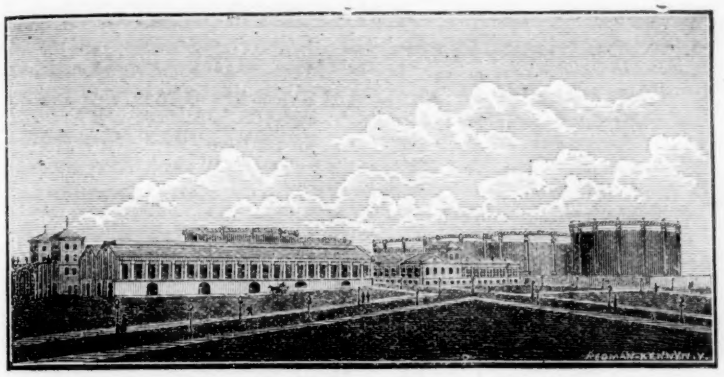
42 PINE STREET, ROOM 18.

The undersigned having been appointed Special Agent for the introduction of GIBSON'S Substitute for Dip-Pipes in the Manufacture of Coal Gas, respectfully presents for the consideration of Gas-Light Companies the Circulars and Pamphlet issued by the American Coal Gas-Light Imp. Co., descriptive of the value of GIBSON'S Improvement, and the mode by which Gas-Light Companies can satisfy themselves of its usefulness, without trouble or expense, at their own works.

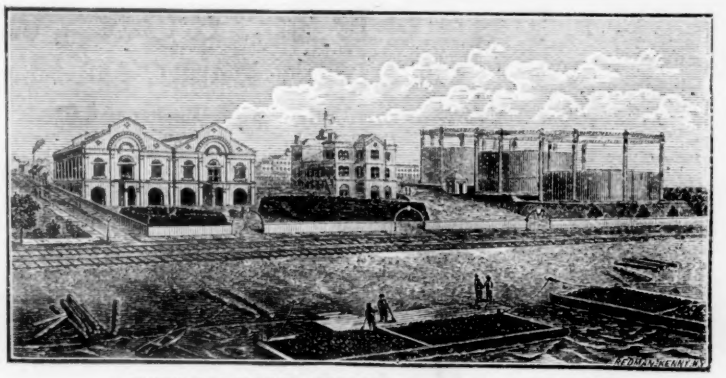
Orders for fitting up Valves of any desired form or patent, *subject to the generality of the Gibson claim*, and also for SUPPLIES and MATERIALS of every description required for the use of Gas Light Companies promptly attended to by

W. H. GRENELLE, Special Agent.

REFERENCE.—RICHARD MERRIFIELD, Esq, late Vice President MANHATTAN GAS-LIGHT COMPANY.



CINCINNATI GAS WORKS. ERECTED 1871-72-73.—WM. FARMER, ENG.



ACLEDE GAS WORKS, ERECTED 1872.—WM. FARMER, ENG

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ARCHITECT AND GENERAL GAS ENGINEER,

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WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description of buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Hydraulic Mains for Retort Benches,
Blowers for Forges, Foundries, &c.
Pumps for Water, &c., &c.

REFERENCES:

Professor SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL, N. Y.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio.
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company. St. Louis, Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
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GAS PURIFICATION.

St. John and Cartwright's
NEW IRON COMPOSITION

Has purified, per bushel, on a single test, 10,000 feet of Westmoreland Gas. With revivification lasts indefinitely. Surpasses in POWER and ECONOMY all known materials. Saves largely in FIRST COST, SPACE, LABOR, SUPERINTENDENCE, and all current expenses. Will purify *easily* sulphurous gas, wholly *unmanageable by lime*. Takes out *all the ammonia*. Now operating in the following Gas Works: Harlem New York (21st street); Port Morris; Hunter's Point; East New York Worcester, Lynn and Cambridge, Mass.; Lewiston, Maine; St, Albans, Vt.; Pawtucket, R. I.; Meriden, Ct.; and being introduced in many other places.

Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

For further information and instructions, apply to
ST. JOHN & CARTWRIGHT,
21st Street and Avenue A, New York Gas Works.

☞ Immediate arrangements are urged, as the demand for e prepared composition is increasing *so rapidly* that delays supply may occur.

B. S. BENSON.

MANUFACTURER OF

Cast Iron Pipes and Fittings,

AND

Gas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

Office & Factory 52 East Monument St.,
BALTIMORE, MD.

OHIO GAS CANNEL,
From the Sterling Colliery.

We are now prepared to place in the market, through our agents as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. The analysis made in 1871 by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47½ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker. The above test has been fully substantiated as correct, and can confidently recommend trial of the coal.

TUTTLE & GIRTY Proprietors,
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Cast and Wrought Iron Work

Used in the Erection of Gas and Coal Oil Works.

Foundry on MILL STREET; Nos. 33, 35, 37 and 39.
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Covington, Ky., Gas Co.	Peoria, Ill., Gas Co.
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Camden Iron Works

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ALL KINDS OF CASTINGS AND APPARATUS FOR GA WORKS,

Wrought Iron Roof Frames,

For Retort and other houses. Retorts and all castings required for setting them in the latest and most improve model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTER for relieving the Retorts from pressure. PURIFIERS, varying from 2,000 to 2,000,000 cubic feet daily purifying capacity.

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With cast iron guide and suspension frames. GAS GOVERNORS or REGULATORS, STREET MAINS, from 1½ to 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SIEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

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All the Smith and Sheet Iron work required in and about Gas Works. 226-tf

JESSE W. STARR. BENJ. A. STARR. BENJ. F. ARCHE

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PARTIES WRITING TO THE UNDERSIGNED ON G Matters, will please address J. B. CHICHESTER
Engineer, Bayonne and Greenville Gas-Light
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G. W. KRAFT, Proprietor,

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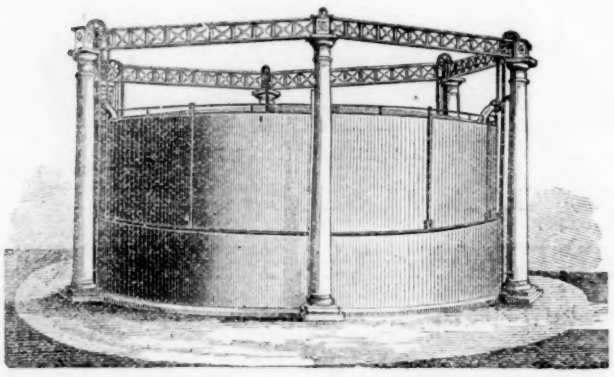
COAL CARS, PURIFYING BOXES, COKE BARROWS.



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S. Millett Thompson, Secretary.

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Fine Gilt Bronze and Marble Clocks, warranted best Timekeepers, Mantle Ornaments, &c.

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Specia designs furnished for Gas Fixtures for Churches Halls Lodges, &c.

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Single and Telescopic.

WROUGHT IRON ROOF FRAMES,

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PIPE CAST VERTICAL.

1½ to 48 inches diameter.

Cast Iron Flange Heating and Steam Pipe.

STOP VALVES FOR WATER OR GAS, ALL SIZES.

Fire Hydrants,

GAS HOLDERS,

TELESCOPIC OR SINGLE.

☞ Castings and Wrought Iron Work of all kinds for Gas Works 953-6m

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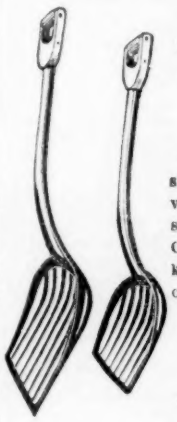
SCREENING SHOVELS.



MADE FROM BEST MALLEABLE IRON AND STEEL.

FURNISHED WITH LONG OR D HANDLES

Perfect in their operation. a very strong, and from their great durability vastly more economical than any substitute. Refer to all the principal gas Companies in the country, who acknowledge them as the "ne plus ultra of Coke Screening Shovels.

Orders addressed only to

O. R. BUTLER,

Sole Agent,

No. 96 Maiden Lane, N. Y.

CAUTION.

Gas Companies, and all parties using Screening Shovels are cautioned against the purchasing (or manufacturing) of any other than myself, or my agents, COKE SCREENING SHOVELS, made either in whole, or in part, of **Malleable Iron,** as such is decided to be an infringement of Butler's Patent of June 4, 1872.

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96 Maiden Lane, N. Y.

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Having erected new Works, offer for sale at a great reduction from cost, the following articles of apparatus:

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Seventy Dip Pipes, 5 inches diameter.
Seventy X Pipes, 5 inches diameter.
Seventy Stand Pipes, 6 to 5 inches diameter.
Seventy Mouth Pieces for 6 inch Stand Pipes.
One set Condensers, 14 inch Pipes with 6 in. internal Pipe.
One Exhauster with Compensator, Governor, Valves, Pass, by and Connecting Pipes, 8 inches diameter, made by Smith & Sayre, in use but a short time; capacity 12,000 feet per hour; has delivered 16,000 with ease; amply sufficient to deliver 350,000 feet a day.
Four Purifiers, 10 by 16 feet, 5 sets trays, 8 inch connections, all in perfect order except the covers.
Wet Centre Seal for the same.
Two sets Hoisting Gear for covers.
Also a Station Meter with 10 inch connections; made by Tufts; has been run but a short time, in perfect order. Capacity 15,000 feet per hour.

Any part or the whole of the above will be sold very cheap, and delivered in six'y days.

Apply by letter or personally to Estes Howe, Treasurer, or William Gibson, Superintendent, at the office of the Company, Harvard Square, Cambridge, Mass. 343-tf

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Portland Cement,

Roman Cement,

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Numbers 1 and 2.

From best London Manufacturers.

FOR SALE BY

S. L. MERCHANT & CO.,

76 South Street, New York,

Corner Maiden Lane. 344-1y

THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

To Gas Light Companies throughout the country.
Agents, PARMELEE BROTHERS, No. 32 Pine street, N. Y
BANGS & HORTON, No. 31 Duane street, Boston.
Mines in Harrison County, West Virginia.
Wharves Locust Point, } Baltimore.
Company's Office, 29 South street, }

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine.

. Reference to them is requested 204-1y

FOR SALE.—TWO IRON TRUSS RETORT HOUSE Roofs, with Ventilators, complete; as good as new. One of them will cover a building 28 feet by about 75 feet; the other 30 feet by 45 feet or 50 feet, all in the clear. For further particulars address F. A. SABBATON,
341-tf Sup't Troy Gas-Light Co., N. Y.

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Of West Virginia.

OFFICE, 56 EXCHANGE PLACE.
(P. O. Box 432.)
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Thomas Gemmell, *President.*
A. Robinson, *Vice-President and Treasurer.*
Benjamin Bissell, *Secretary.*

Mines at Wilsonburg, Harrison Co., W. Va.
Shipping Port, Baltimore.

This coal yields of Gas 11,200 cubic feet per ton of 2,240 lbs. and has an Illuminating Power of 16.30 st. candles. 350-3m

EVENS & HOWARD,

Manufacturers of a superior quality of

Fire-Brick, Clay Gas Retorts,

Gas Tile, Drain Pipe, Fine Ground Fire Clay, &c.

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AND PIPE WORKS

OFFICE AND WORKS—CARROLL, PIKE, SMALLMAN AND WILKINS STREETS,

PITTSBURGH, PA

WM. SMITH,

Manufacturer of all kinds of GAS and WATER PIPE BRANCHES, CONNECTIONS, T's, ELBOWS, and all CASTINGS USED AT GAS AND WATER WORKS,

We offer special inducements to parties wishing to purchase. My Pipe is Smooth, regular in weights, and cast vertically.

N. B.—Pipe from 3-inch and upwards, cast in 12-ft. lengths.

☞SEND FOR CIRCULAR AND PRICE LIST.☜

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SHIPPING POINT—Baltimore, Md.

This coal yields 10,000 cubic feet of Gas, with an illuminating power of over 16 candles. Forty bushels of very superior Coke, with little Ash, and scarcely any clinker. 304-1y

NEWARK GAS BURNER MAN'G CO.

Manufacturers of all the

NEW AND IMPROVED

BRASS GAS BURNERS.

The *best* Gas Burners in the World for Street Lamps; also for Portable Gas Machines, to order.

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37-3m

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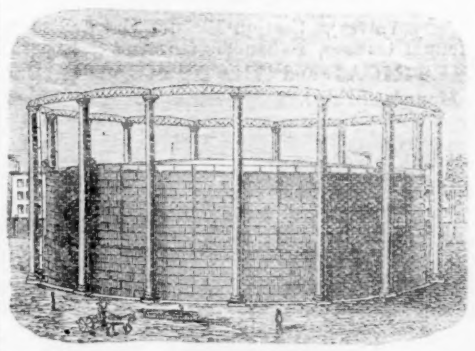

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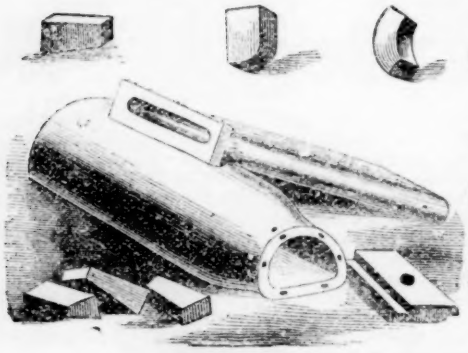

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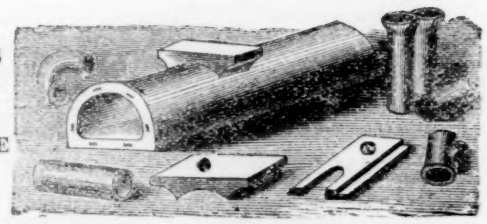

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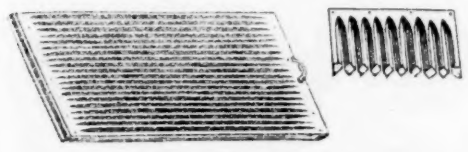

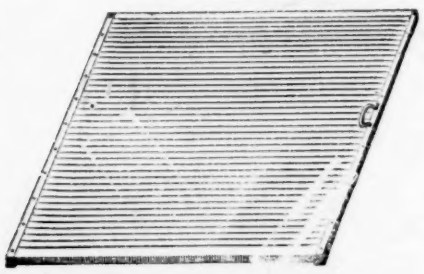

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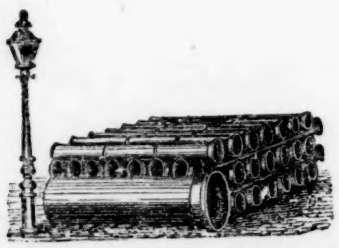

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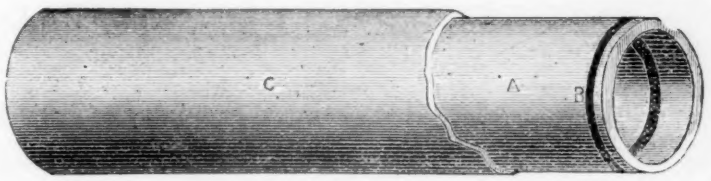

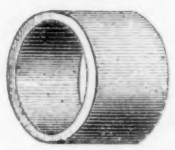

FIG. 2.

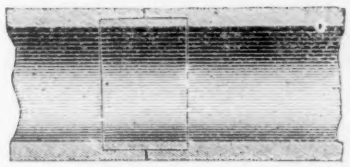

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cemen

FIG. 2.—Thimble for Connection. FIG. 3—Horizontal Section and Connection.

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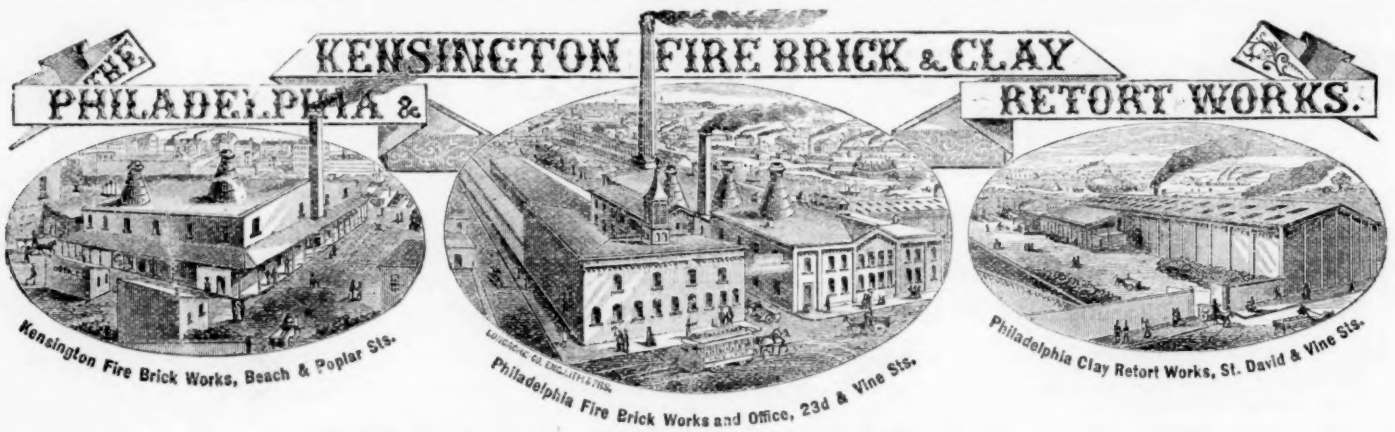
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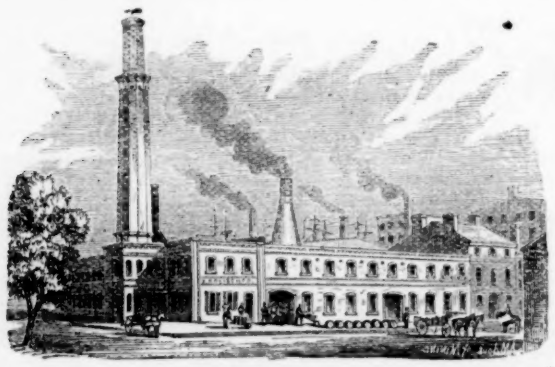

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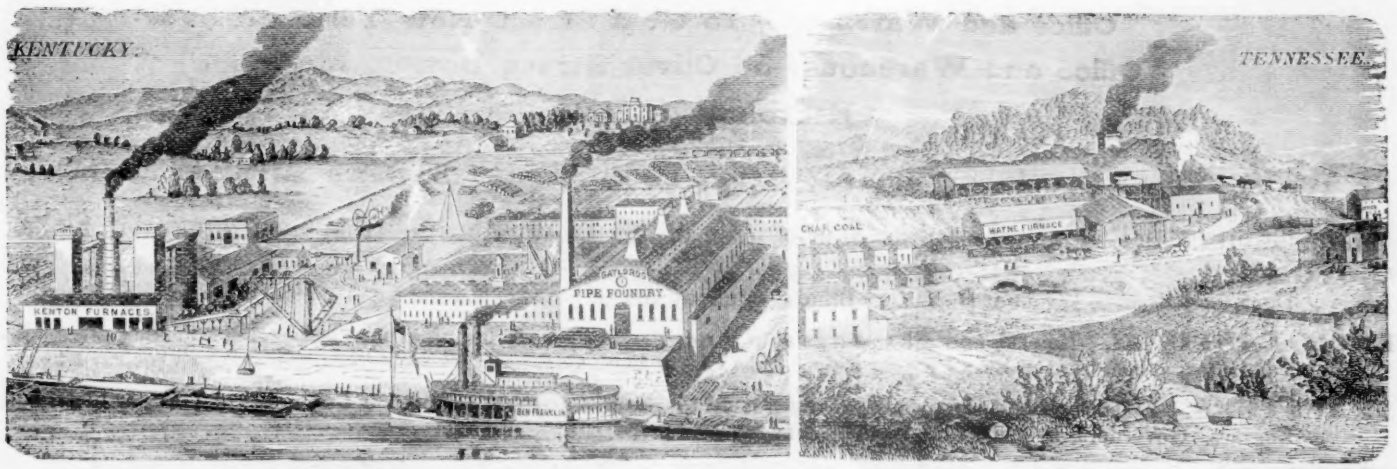

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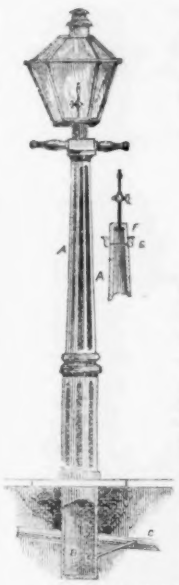

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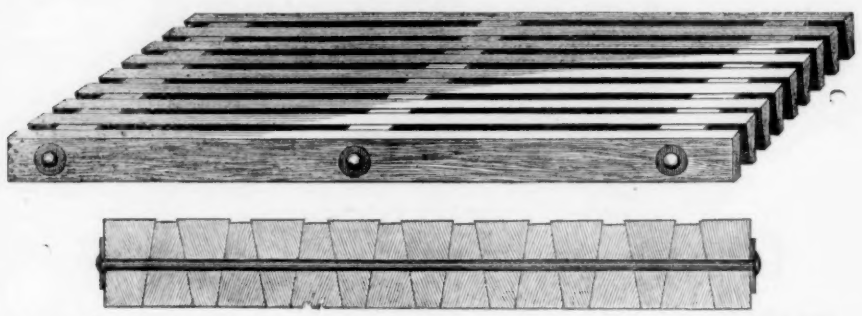

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